



Sociocognitive predictors of the intention of healthcare workers to receive the influenza vaccine in Belgian, Dutch and German hospital settings

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SUMMARY

Background: Influenza vaccination of healthcare workers (HCWs) is recommended to prevent the transmission of influenza to vulnerable patients. Nevertheless, vaccination coverage rates of HCWs in European countries have been low.

Aim: To investigate the relative and combined strength of sociocognitive variables, from past research, theory and a qualitative study, in explaining the motivation of HCWs to receive the influenza vaccine.

Methods: An anonymous, online questionnaire was distributed among HCWs in hospital settings in Belgium, Germany and the Netherlands between February and April 2013.

Findings: Attitude and past vaccination uptake explained a considerable amount of variance in the intention of HCWs to receive the influenza vaccine. Moreover, low perceived social norms, omission bias, low moral norms, being older, having no patient contact, and being Belgian or Dutch (compared with German) increased the probability of having no intention to receive the influenza vaccine compared with being undecided about vaccination. High intention to receive the influenza vaccine was shown to be more likely than being undecided about vaccination when HCWs had high perceived susceptibility of contracting influenza, low naturalistic views, and lower motivation to receive the vaccine solely for self-protection.

Conclusion: Country-specific interventions and a focus on different sociocognitive variables depending on the intention/lack of intention of HCWs to receive the influenza vaccine may be beneficial to promote vaccination uptake.

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Introduction

Influenza is a major public health problem causing severe morbidity and mortality in high-risk groups.^{1,2} Previous research has shown that vaccination of healthcare workers (HCWs) reduces all-cause mortality in patients in long-term care by up to 29%,^{1,3,4} and may have a similar or even higher impact among patients in acute care settings.^{5–8} Health

authorities therefore recommend the vaccination of HCWs.^{9,10} Nevertheless, vaccination coverage rates of HCWs in European countries have been low, ranging from 6.4% to 26.3%.^{11–13}

Intervention programmes to increase influenza vaccination rates in HCWs have been developed,^{14–16} but these programmes show, at best, small effects on vaccination behaviour, and their long-term success is unknown. Kok *et al.*¹⁷ suggested that a systematic approach (i.e. intervention mapping) is needed for the successful development and implementation of programmes to promote influenza vaccination in HCWs, starting with a detailed analysis of the problematic behaviour and identifying sociocognitive variables that drive the recommended behaviour.

Recently, the authors conducted individual semi-structured interviews with HCWs in Belgium, Germany and the Netherlands ($N = 123$) to obtain in-depth understanding of the reasons for vaccination/non-vaccination against influenza, and to gain input for the development of the survey instrument used in this study. The results reflected most of the findings that have been reported previously in review studies on drivers of influenza vaccination.^{18–20} Acceptance of influenza vaccination was found to be positively associated with self-protection motives; willingness to protect patients, family members and/or colleagues; positive perceived norms towards vaccination; perceived moral obligations to receive the vaccine; and the capacity to receive the vaccine conveniently. Low perceived susceptibility of contracting influenza, low perceived severity of influenza, and lack of belief in the relevance of influenza vaccination and the supporting scientific evidence were identified as reasons for non-vaccination. Being older and being a physician as opposed to a nurse were associated with higher acceptance of influenza vaccination, as was previous vaccine uptake.^{18–20}

In addition to these variables, three additional beliefs were identified that had a negative influence on vaccination: omission bias, naturalistic beliefs and prevention beliefs. Omission bias is the preference of inaction, when action might cause harm, and has previously been associated with parental decisions not to vaccinate their children.²¹ Naturalistic beliefs are based on the idea that it is better for one's health to undergo illness and generate antibodies than to prevent illness by vaccination. Prevention beliefs entail different means of prevention (e.g. regular hand disinfection, staying at home when ill) that are considered to be effective, or more effective than vaccination, for the prevention of influenza.²²

The relative strength of these and other identified variables in explaining the motivation of HCWs in hospital settings in Belgium, Germany and the Netherlands to receive the influenza vaccine is not clear. As such, the authors conducted a cross-sectional survey to assess the relative and combined strength of the previously identified sociocognitive variables and three additional beliefs in explaining the intention of HCWs. Moreover, the qualitative study suggested between-country differences in the variables influencing HCWs' vaccination intention. This may suggest the need to develop country-specific interventions in the future.

Methods

Participants and procedure

A cross-sectional study was performed between February and April 2013 in 20 hospitals in Belgium, Germany and the

Netherlands. Hospitals were initially contacted by telephone, and subsequently sent detailed information about participation in the study via email or letter, if requested. In Belgium, 24 hospitals in 19 cities were approached, resulting in participation of seven hospitals (29%). In Germany, 33 hospitals in 16 cities were contacted, resulting in participation of seven hospitals (21.2%). In the Netherlands, 21 hospitals in 14 cities were contacted, resulting in participation of six hospitals (28.6%). Included hospitals provided a contact person (e.g. the occupational physician) who agreed to distribute an email widely within their hospital, either through contacts at ward level or through hospital distribution lists, with information about the study and a link to the online survey. Approximately three weeks later, a second email was sent to the contact person with a request to forward the reminder to hospital employees in case they had not participated. To ensure anonymity, participants were not asked to provide the name of the hospital or department in which they worked.

Online survey

The online survey consisted of 80 questions designed to target variables identified from the literature and the qualitative study: sociocognitive variables and additional beliefs about annual influenza vaccination, past behaviour and experiences, and sociodemographics. Variables were measured on seven-point Likert scales ranging from one (totally disagree) to seven (totally agree), unless otherwise indicated. Items measuring the same underlying theoretical construct were averaged into one single construct when internal consistency was sufficient [Cronbach's $\alpha > 0.60$ or Pearson correlation coefficient ($r > 0.50$)]. Table 1 provides an overview of the constructs and their internal consistency. In addition, past vaccination behaviour was measured with two questions ('In past years, I got vaccinated against influenza when it was offered to me. Always/never'; 'Did you get vaccinated against influenza this year (season 2012/2013)? Yes/no'). Past experience of having influenza was measured with two questions ('How often have you had influenza in the past? Never/more than 10 times'; 'Did you have influenza last winter? No/yes, once/yes, more than once'). Demographic measures were profession (physician/nursing staff/other HCW with patient contact/non-HCW with no patient contact), sex, country and age group (<20 years/20–29 years/30–39 years/40–49 years/50–59 years/ ≥ 60 years). Age categories were chosen to ensure anonymity of participants.

Data analysis

Statistical Package for the Social Sciences Version 19.0 (IBM Corp., Armonk, NY, USA) was used for data analysis. Informed by a descriptive analysis of the sample (frequencies), univariate associations between intention, sociocognitive variables and additional beliefs were analysed using Pearson's correlation coefficients. Differences between HCWs from Belgium, Germany and the Netherlands were tested with multi-variate analysis of covariance (MANCOVA), while controlling for significant differences between the three samples in terms of demographic and influenza-related characteristics. Intention was shown to have a U-shaped distribution and was classified into three groups: no intention to receive the influenza vaccine ($0 = 1.0$), not made a clear decision about vaccination

Table I
Overview of constructs measured by the online survey

Variable	Number of items	Reliability	Example questions
Intention	2	$r = 0.97$	I intend to get vaccinated against influenza annually
Attitude	6	$\alpha = 0.92$	Getting vaccinated against influenza annually is: very good–very bad; comforting–frightening
Subjective norm	4	$\alpha = 0.70$	Most of my colleagues get vaccinated against influenza annually
Perceived severity of influenza	2	$r = 0.37$	Influenza is a serious infection that can lead to complications
Perceived susceptibility of contracting influenza	3	$\alpha = 0.68$	I am healthy, therefore I don't need to get vaccinated against influenza annually
Capacity	1	n.a.	I am confident that I could get vaccinated against influenza annually (if I wanted to)
Autonomy	1	n.a.	Getting vaccinated against influenza annually is completely up to me
Omission bias	1	n.a.	I prefer to get influenza, instead of getting vaccinated against influenza
Prevention beliefs	3	$\alpha = 0.62$	By staying at home when I am ill, I can sufficiently protect patients from getting influenza
Naturalistic beliefs	3	$\alpha = 0.80$	I think that it is better to undergo influenza than to get vaccinated against influenza annually
Disbelief in scientific evidence for effectiveness of influenza vaccine	2	$r = 0.60$	As far as I know, there is insufficient scientific evidence that influenza vaccination is effective in preventing influenza
Disbelief in relevance of influenza vaccine	3	$\alpha = 0.80$	I think that the relevance of annual influenza vaccination is overestimated
Moral norm	2	$r = 0.69$	If I was vaccinated against influenza annually, I would do it to protect my environment
Responsibility	2	$r = 0.62$	I think it is the responsibility of healthcare workers to get vaccinated against influenza annually
Self-protection	1	n.a.	If I was vaccinated against influenza annually, I would do it to protect myself
Management	4	$\alpha = 0.84$	How satisfied are you with the management of this hospital? Very satisfied–not at all satisfied

(1 = 1.5–6.5) and high intention of receiving the influenza vaccine (2 = 7.0). Therefore, multi-nominal logistic regression was used to identify the effect of the independent variables on the probability of: (1) having no intention of receiving the influenza vaccine vs not having made a clear decision about vaccination, and (2) having high intention of receiving the influenza vaccine vs not having made a clear decision about vaccination. Stepwise multi-nominal logistic regressions were performed in order to examine the contribution of socio-cognitive variables (Model 1), additional beliefs (Model 2), and past behaviour and demographics (Model 3) in explaining vaccination intention, and to demonstrate differences in classification accuracy. The Nagelkerke index was chosen above the Cox and Snell index, because it is an appropriate adjustment, allowing for a maximum value of 1.00.²³

Results

Descriptive statistics

In total, 1022 individuals working in hospital settings participated in this study: 298 in Belgium, 206 in Germany and 518 in the Netherlands (Table II). Of the participants, 227 were male (22.2%) and 795 were female (77.9%). Most participants were aged 40–59 years (58.5%). Respondents included 570 nurses (55.8%) and 152 physicians (14.9%); 142 participants

(13.9%) were other HCWs with patient contact (e.g. paramedics, physiotherapists, dieticians), and 158 (15.5%) participants were non-HCWs with no direct patient contact (e.g. administrative workers, microbiologists, management). In total, 379 (37.1%) participants had been vaccinated in the influenza season 2012/2013 and 195 (19.1%) participants had experienced influenza-like illness (ILI) in influenza season 2012/2013.

Chi-squared analyses showed differences between respondents from the three countries in terms of sex, age group, occupation, vaccination status in influenza season 2012/2013, and ILI in influenza season 2012/2013 ($P < 0.05$).

Differences between HCWs from different countries

Table III presents the means and standard deviations for Belgian, German and Dutch HCWs for sociocognitive variables and additional beliefs, and the results of the MANCOVA testing differences between the three countries, controlling for significant differences in sex, age group, occupation, vaccination status in influenza season 2012/2013, and ILI in influenza season 2012/2013 among the three samples. In comparison with Dutch and German HCWs, Belgian HCWs had significantly higher intention to receive the influenza vaccine, were more satisfied with the hospital management, and felt more responsibility to receive the influenza vaccine. Dutch HCWs had significantly lower scores for attitude, perceived

Table II
Demographics and characteristics of healthcare workers (HCWs)

	Netherlands (N = 518, 50.7%)	Belgium (N = 298, 29.2%)	Germany (N = 206, 20.1%)	Total (N = 1022)
Sex				
Male	84 (16.2)	66 (22.1)	77 (37.4)	227 (22.2)
Female	434 (83.8)	232 (77.9)	129 (62.6)	795 (77.8)
Age (years)				
<20			1 (0.5)	1 (0.1)
20–29	83 (16)	47 (15.8)	25 (12.1)	155 (15.2)
30–39	101 (19.5)	69 (23.2)	51 (24.8)	221 (21.6)
40–49	146 (28.2)	76 (25.5)	74 (35.9)	296 (29)
50–59	158 (30.5)	95 (31.9)	48 (23.3)	301 (29.5)
≥60	28 (5.4)	11 (3.7)	5 (2.4)	44 (4.3)
Occupation				
Physician	48 (9.3)	21 (7)	83 (40.3)	152 (14.9)
Nursing staff	277 (53.5)	206 (69.1)	87 (42.2)	570 (55.8)
Other HCW, patient contact	98 (18.9)	36 (12.1)	8 (3.9)	142 (13.9)
Non-HCW, no patient contact	95 (18.3)	35 (11.8)	28 (13.6)	158 (15.5)
Vaccinated in influenza season 2012/2013	146 (28.2)	158 (53)	75 (36.4)	379 (37.1)
ILI in influenza season 2012/2013	107 (20.7)	35 (11.7)	53 (25.7)	195 (19.1)

ILI, influenza-like illness.

Data are reported as N (%).

norm, perceived susceptibility of contracting influenza, moral norm, capacity, autonomy and vaccination frequency than German and Belgian HCWs. Moreover, lack of belief in the relevance of the influenza vaccine and omission bias were significantly higher among Dutch HCWs compared with German and Belgian HCWs. Perceived severity of influenza, self-protection motives, lack of belief in the scientific evidence for effectiveness of the influenza vaccine, and

naturalistic beliefs differed significantly between the three countries. Perceived severity of influenza was lowest among Dutch HCWs and highest among German HCWs. Self-protection motives and naturalistic beliefs were highest among Dutch HCWs and lowest among German HCWs. Lack of belief in the scientific evidence for effectiveness of the influenza vaccine was lowest among Belgian HCWs and highest among Dutch HCWs.

Table III
Differences between Dutch, Belgian and German healthcare workers (HCWs)

Variable	Dutch HCWs (N = 518)	Belgian HCWs (N = 298)	German HCWs (N = 206)	F value
Intention	0.85 (0.71) ²	1.27 (0.71) ^{1,3}	0.99 (0.78) ²	6.776**
Attitude	4.17 (0.04) ^{2,3}	4.65 (0.06) ¹	4.71 (0.06) ¹	32.207**
Subjective norm	2.79 (1.00) ^{2,3}	3.66 (1.23) ¹	3.48 (1.08) ¹	46.875**
Perceived severity of influenza	5.37 (1.05) ^{2,3}	5.68 (1.03) ^{1,3}	5.91 (0.89) ^{1,2}	23.442**
Perceived susceptibility of contracting influenza	3.77 (1.64) ^{2,3}	4.86 (1.72) ¹	4.72 (1.69) ¹	28.053**
Capacity	5.83 (1.89) ³	6.22 (1.53) ³	6.48 (1.29) ^{1,2}	8.616**
Autonomy	6.50 (1.10) ²	6.57 (0.96)	6.67 (0.85) ¹	3.895*
Management	4.53 (1.09) ²	5.02 (1.15) ^{1,3}	4.38 (1.11) ²	19.199**
Moral norm	4.35 (1.65) ^{2,3}	5.32 (1.59) ¹	5.35 (1.48) ¹	28.806**
Responsibility	4.27 (1.84) ²	5.24 (1.89) ^{1,3}	4.43 (2.09) ²	7.433**
Self-protection	3.57 (1.98) ^{2,3}	2.63 (1.71) ^{1,3}	2.29 (1.53) ^{1,2}	37.345**
Disbelief in scientific evidence for effectiveness of influenza vaccine	4.25 (1.36) ^{2,3}	3.22 (1.53) ¹	3.50 (1.63) ¹	27.692**
Disbelief in relevance of influenza vaccine	4.74 (1.27) ^{2,3}	3.55 (1.47) ^{1,3}	4.02 (1.62) ^{1,2}	38.850**
Prevention beliefs	3.84 (1.25)	4.05 (1.42)	3.94 (1.47)	1.157
Naturalistic beliefs	4.09 (1.55) ^{2,3}	3.23 (1.55) ^{1,3}	3.07 (1.67) ^{1,2}	23.073**
Omission bias	3.67 (2.06) ^{2,3}	2.52 (1.80) ¹	2.92 (2.04) ¹	13.052**
Vaccination frequency	3.20 (2.46) ²	4.49 (2.59) ¹	3.72 (2.46)	3.139*

Data are reported as mean (standard deviation).

* $P < 0.05$, two-tailed; ** $P < 0.01$, two-tailed.The superscripts indicate which mean scores in a row differ significantly ($P < 0.05$).

Covariates included in this analysis were sex, age group, occupation, vaccination status in influenza season 2012/2013, and influenza-like illness in influenza season 2012/2013.

Associations between variables and intention to receive the influenza vaccine

All sociocognitive variables and additional beliefs were significantly correlated with intention to receive the influenza vaccine. Strong positive univariate associations with intention were found for the following variables: attitude, perceived norm, perceived susceptibility of contracting influenza, moral norm, responsibility as HCW and past vaccination frequency. Strong negative associations with intention to receive the influenza vaccine were found for the variables: lack of belief in the relevance of the influenza vaccine, lack of belief in the scientific evidence for effectiveness of the vaccine, naturalistic views and omission bias. Multi-variate analysis was conducted to further explore predictors of intention and lack of intention to receive the influenza vaccine.

No intention to receive the influenza vaccine vs no clear decision about vaccination

The results of the multi-nominal logistic regression are shown in Table IV. Results of the final model are described. HCWs were more likely to have no intention to receive the influenza vaccine, compared with being undecided about vaccination, when they reported a more negative attitude and perceived norm towards influenza vaccination, omission bias, lower moral norm to protect patients by receiving the influenza vaccine, lower frequency of influenza vaccinations in the past, and were older. Furthermore, other HCWs with patient contact were significantly less likely to have no intention to receive the influenza vaccine than non-HCWs with no patient contact.^a Finally, Dutch and Belgian HCWs were significantly more likely to have no intention to receive the influenza vaccine than German HCWs.

High intention to receive the influenza vaccine vs no clear decision about vaccination

HCWs with a positive attitude towards influenza vaccination, high perceived susceptibility of contracting influenza, low naturalistic views, self-protection motives and satisfaction with the hospital management were significantly more likely to have high intention to receive the influenza vaccine than to be undecided about vaccination. Also, a higher frequency of influenza vaccinations in the past increased the probability of high intention to receive the influenza vaccine compared with no clear decision about vaccination.

The multi-nominal logistic regression with the socio-cognitive variables as predictors showed classification accuracy of 75.1% (pseudo $R^2 = 0.73$). By adding the additional beliefs as predictors and past behaviour and demographic variables, the classification accuracy increased to 78.8% (pseudo $R^2 = 0.82$). Likelihood ratio tests confirmed a significant contribution of the additional predictors [Model 1 vs Model 2: likelihood ratio $\chi^2(18) = 87.568$, $P < 0.001$; Model 2 vs Model 3: likelihood ratio

$\chi^2(18) = 166.529$, $P < 0.001$; Model 1 vs Model 3: likelihood ratio $\chi^2(36) = 254.097$, $P < 0.001$].^b

Discussion

Differences were found between HCWs from neighbouring countries. Belgian HCWs scored highest overall on socio-cognitive variables and additional beliefs that have a positive effect on intention to receive the influenza vaccine. They also had the highest vaccine uptake rate (53%) and the highest number of past vaccinations. In contrast, Dutch HCWs scored highest overall on sociocognitive variables and additional beliefs that have a negative effect on intention to receive the influenza vaccine, and had the lowest vaccination uptake rate among the three countries (28.2%). German HCWs were more similar to Belgian HCWs than Dutch HCWs with respect to sociocognitive variables and additional beliefs. The vaccine uptake rate of German HCWs was 36.4% and a large proportion consisted of physicians; this professional group is known to be more positively inclined towards influenza vaccination than nursing staff.^{19,24}

The results also suggest that different sociocognitive variables, additional beliefs, past experiences and demographics influence whether a HCW has no intention of receiving the influenza vaccine, is unsure about vaccination, or has high intention of receiving the influenza vaccine. Attitude was the strongest predictor and correlate of intention and, in turn, correlated moderately to strongly with the additional beliefs included in the analyses. The second strongest predictor of intention was the past behaviour of participants (i.e. how often they had been vaccinated in the past). Although past behaviours cannot be changed, this information is important because past behaviours shape perceptions and affect intention to perform behaviours. In previous studies, strong perceived and moral norms were found to promote influenza vaccination.^{25,26} This study suggests that although the perception that colleagues are opposed to vaccination and have not been vaccinated, and not feeling morally responsible to receive the vaccine to protect others, lower the motivation to receive the influenza vaccine, the opposite does not lead to high intention to receive the influenza vaccine. HCWs who reported that they were less influenced by their peers, and based their intention on moral responsibility and high perceived susceptibility of contracting influenza were more likely to report high intention to receive the influenza vaccine. Also, in line with van den Dool *et al.*,²⁵ high perceived susceptibility of contracting influenza was found to be predictive of vaccination intention.

This study identified some factors that have not previously been reported to be associated with vaccination intention (i.e. omission bias, prefer not to get vaccinated if individual believes that vaccination could cause illness). Omission bias is related to other well-documented reasons for non-

^a Without non-HCWs with no patient contact in the model, the lack of belief in the relevance of influenza vaccination also made it more likely for HCWs to have no intention to receive the influenza vaccine compared with being undecided about vaccination. No other differences were detected when non-HCWs were excluded from the analysis.

^b Additional analyses were conducted to test for interactions between each predictor variable and country. Next to a single significant interaction between perceived severity of influenza and country for the comparison of no intention to receive the influenza vaccine vs no clear decision about vaccination ($P \geq 0.05$), no further interactions were detected. Therefore, country was only included as the main effect, and thus controlled for possible effects of country when predicting the contributions of the other predictors.

Table IV
Multi-nominal logistic regression

Predictors	<i>r</i>	Model 1 ^a				Model 2 ^b				Model 3 ^c			
		<i>b</i>	S.E.	Wald	<i>P</i>	<i>b</i>	S.E.	Wald	<i>P</i>	<i>b</i>	S.E.	Wald	<i>P</i>
<i>No intention to receive the influenza vaccine vs no clear decision about vaccination (N = 731)</i>													
Attitude	−0.53**	−1.36	0.13	114.14	0.000	−1.11	0.15	55.95	0.000	−0.98	0.16	37.68	0.000
Subjective norm	−0.30**	−0.29	0.11	6.86	0.009	−0.26	0.12	4.96	0.03	−0.30	0.13	5.15	0.02
Perceived susceptibility of contracting influenza	−0.26**	0.03	0.07	0.133	0.72	0.09	0.08	1.20	0.27	0.10	0.09	1.25	0.26
Perceived severity of influenza	−0.10**	0.03	0.09	0.09	0.76	0.15	0.10	2.23	0.14	0.07	0.11	0.44	0.51
Autonomy	0.17**	0.35	0.11	9.84	0.002	0.30	0.12	6.32	0.01	0.23	0.13	2.90	0.09
Capacity	−0.06	0.07	0.05	2.10	0.15	0.08	0.05	2.12	0.15	0.06	0.06	1.15	0.28
Omission bias	0.40**					0.25	0.06	14.54	0.000	0.23	0.07	11.38	0.001
Naturalistic beliefs	0.31**					−0.05	0.09	0.26	0.61	−0.03	0.10	0.11	0.74
Disbelief in scientific evidence for effectiveness of influenza vaccine	0.25**					−0.16	0.10	2.34	0.13	−0.16	0.11	2.08	0.85
Disbelief in relevance of influenza vaccine	0.31**					0.11	0.10	1.19	0.28	0.19	0.11	2.70	0.10
Prevention beliefs	−0.13**					−0.03	0.08	0.14	0.71	0.00	0.09	0.00	0.98
Moral norm	−0.37**					−0.27	0.07	14.49	0.000	−0.27	0.08	12.65	0.000
Responsibility	−0.37**					−0.19	0.06	9.27	0.002	−0.12	0.07	2.43	0.12
Self-protection	0.11**					−0.07	0.06	1.42	0.23	0.01	0.06	0.04	0.84
Management	−0.13**					−0.19	0.09	4.13	0.04	−0.15	0.10	2.23	0.14
Influenza last season	−0.01									0.24	0.15	2.61	0.11
Vaccination frequency	−0.45**									−0.57	0.10	31.96	0.000
Age group	0.08*									0.20	0.10	4.46	0.04
Sex	0.08*									0.36	0.29	1.56	0.21
Physician	−0.09*									−0.22	0.46	0.22	0.64
Nursing staff	0.07*									−0.34	0.30	1.81	0.18
Other HCWs, patient contact	−0.08*									−0.87	0.39	4.97	0.03
Non-HCWs, no patient contact	.									.	.	.	.
The Netherlands	0.06									−1.47	0.35	17.85	0.000
Belgium	−0.14**									−1.28	0.37	12.05	0.001
Germany	.									.	.	.	.
<i>High intention to receive the influenza vaccine vs no clear decision about vaccination (N = 733)</i>													
Attitude	0.73**	1.86	0.18	101.67	0.000	1.63	0.21	61.09	0.000	1.38	0.25	30.78	0.000
Subjective norm	0.37**	0.19	0.12	2.59	0.11	0.11	0.13	0.78	0.38	0.18	0.15	1.45	0.23
Perceived susceptibility of contracting influenza	0.63**	0.71	0.11	42.56	0.000	0.60	0.12	24.53	0.000	0.64	0.16	16.77	0.000
Perceived severity of influenza	0.27**	−0.15	0.14	1.09	0.30	−0.20	0.15	1.74	0.19	0.12	0.19	0.44	0.51
Autonomy	0.03	0.01	0.114	0.01	0.92	−0.05	0.12	0.16	0.69	0.10	0.14	0.56	0.46
Capacity	0.31**	0.25	0.16	2.33	0.13	0.15	0.18	0.70	0.40	0.38	0.22	2.92	0.09
Omission bias	−0.52**					−0.16	0.11	2.22	0.14	−0.11	0.14	0.57	0.45
Naturalistic beliefs	−0.57**					−0.39	0.13	8.95	0.003	−0.37	0.16	5.16	0.02
Disbelief in scientific evidence for effectiveness of influenza vaccine	−0.47**					−0.14	0.12	1.24	0.27	−0.17	0.15	1.30	0.26
Disbelief in relevance of influenza vaccine	−0.52**					0.15	0.13	1.30	0.25	0.18	0.15	1.36	0.24
Prevention beliefs	0.18**					−0.03	0.11	0.08	0.78	−0.08	0.13	0.40	0.53
Moral norm	0.36**					−0.01	0.11	0.01	0.92	0.07	0.14	0.23	0.64
Responsibility	0.55**					0.28	0.12	5.45	0.02	−0.10	0.16	0.40	0.53
Self-protection	−0.36**					−0.18	0.10	3.53	0.06	−0.25	0.11	5.07	0.02
Management	0.09*					−0.20	0.12	2.49	0.11	−0.39	0.16	6.22	0.01
Influenza last season	−0.07*									0.04	0.17	0.07	0.80
Vaccination frequency	0.70**									1.01	0.15	46.09	0.000
Age group	0.19**									−0.08	0.15	0.27	0.60
Sex	−0.07									−0.27	0.37	0.53	0.47
Physician	0.08*									0.21	0.59	0.13	0.72

(continued on next page)

Table IV (continued)

Predictors	<i>r</i>	Model 1 ^a				Model 2 ^b				Model 3 ^c			
		b	S.E.	Wald	<i>P</i>	b	S.E.	Wald	<i>P</i>	b	S.E.	Wald	<i>P</i>
Nursing staff	−0.08*									0.22	0.46	0.22	0.64
Other HCWs, patient contact	0.03									0.35	0.55	0.39	0.53
Non-HCWs, no patient contact	.									.	.	.	.
The Netherlands	−0.21**									0.61	0.50	1.46	0.23
Belgium	0.18**									0.59	0.51	1.32	0.25
Germany	.									.	.	.	.
Pseudo <i>R</i> ²		0.73				0.77				0.82			
Classification accuracy (%)		75.1				77.1				78.8			

HCW, healthcare worker.

P* < 0.05, two-tailed; *P* < 0.01, two-tailed.

^a Model 1 refers to multi-nominal logistic regression with only the sociocognitive variables as predictors.

^b Model 2 refers to multi-nominal logistic regression with the sociocognitive variables and additional beliefs as predictors.

^c Model 3 refers to multi-nominal logistic regression with the sociocognitive variables, additional beliefs, and demographics and past behaviour as predictors.

immunization: fear of side-effects, fear of long-term illness, and fear that the vaccine could cause influenza.¹⁸ Naturalistic beliefs were common among HCWs in the authors' earlier qualitative study, and were identified as promoting factors for vaccination intention.

Across the three samples, it was possible to explain a substantial amount of variance in vaccination intention. However, some limitations are worth noting. Firstly, some of the concepts were measured with single items in order to reduce the length of the survey for an already time-pressured group of participants. This could have led to lower measurement specificity. Secondly, there could be response bias. The response rate of hospitals willing to participate was low (25.6%), and this may have led to over-representation of hospitals with a well-established vaccination programme, and therefore a high vaccination coverage rate. Thirdly, influenza vaccination in the presence of possible comorbidities of participants was not considered. It should be noted that their reasons for receiving the influenza vaccine could be related to their condition, rather than their occupation. Finally, for reasons of anonymity, participants were not linked to their hospital. Therefore, it was not possible to make a distinction between HCWs working in smaller, peripheral hospitals and HCWs working in university hospitals, and the authors were not able to control for cluster effects at hospital level.

In conclusion, although similar reasons for and against influenza vaccination were found for HCWs, this study showed that HCWs from neighbouring countries exhibited differences in enabling and inhibiting sociocognitive variables and additional beliefs that influence vaccination intention. Intervention development may therefore benefit from a more country-specific approach. Moreover, it may be beneficial for interventions that aim to improve influenza vaccination coverage rates to focus on different sociocognitive variables and additional beliefs depending on whether or not HCWs intend to receive the influenza vaccine. The present findings suggest that different factors are influential for immunizers and non-immunizers.

Conflict of interest statement

None declared.

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